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MINISTRY OF FORESTS

Kootenay Lake Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective January 1, 2002

Larry Pedersen
Chief Forester

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Kootenay Lake Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TSA

The Kootenay Lake TSA comprises approximately 1.2 million hectares in southeastern British Columbia. It is part of the British Columbia Forest Service (BCFS) Nelson Forest Region and is administered from the Kootenay Lake Forest District office near Nelson. The TSA is bounded by the Cranbrook TSA to the east, the Arrow TSA to the west, Glacier National Park to the north, and the U.S. border to the south. Several provincial parks are adjacent to or within the TSA, including Kokanee Glacier, Goat Range, West Arm, Purcell Wilderness Conservancy, Kianuko, Lockhart, and Bugaboo Recreation Area.

The Kootenay Lake TSA contains varied and rugged topography. Two mountain ranges—the Selkirks and the Purcells—are separated by the Kootenay Lake valley. A variety of climatic conditions occurs within the TSA, contributing to diverse forests. The primary tree species are Douglas-fir, lodgepole pine, western larch, Engelmann spruce, subalpine fir, western redcedar and western hemlock. Ponderosa pine, western white pine, whitebark pine, aspen, birch and cottonwood occur in smaller amounts.

Of the entire TSA, about 136 000 hectares are not managed by the provincial government and an additional 486 300 hectares are considered non-productive or non-forested, including rock, swamp, alpine areas and water bodies. The Crown-managed productive forest is about 613 300 hectares or 49 percent of the total TSA area.

The Kootenay Lake TSA encompasses the communities of Nelson, Creston, Kaslo, Meadow Creek, Argenta, and Yahk. In 1996, the population of the TSA was approximately 33,000, of which about 50 percent reside in the major communities of Nelson, Creston and Kaslo. Forestry and mining are the major resource sectors in the TSA's economy.

History of the AAC

The Kootenay Lake TSA was established in 1981 with an AAC of 900 000 cubic metres. This was reduced to 700 000 cubic metres which is the current AAC, effective June 1, 1995.

The current AAC is apportioned by the Minister of Forests as follows:

Apportionment	cubic metres/year	percentage
Forest licences – replaceable	506 403	72.3
Forest licences – non-replaceable	25 000	3.6
Timber sale licences - < or = 10 000 m^3/yr	285	0.1
Small Business Forest Enterprise Program	143 010	20.4
Forest service reserve	7 002	1.0
Woodlot licences	18 300	2.6
Total AAC	700 000	100.0

New AAC determination

Effective January 1, 2002, the new AAC for the Kootenay Lake TSA will be 681 300 cubic metres.

This determination excludes 9000 cubic metres for woodlot licences issued since the 1995 determination, and 9700 cubic metres for the Harrop-Procter Community Forest.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for the Kootenay Lake TSA include the following:

- *Kootenay Lake TSA Data Package and Information Report*, BCFS, May 1999;
- *Kootenay Lake TSA Analysis Report and Public Discussion Paper*, BCFS, March 2001;
- Kootenay Lake TSA Summary of Public Input, BCFS, November 2001;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province;
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources;
- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the BCFS, including the AAC determination meeting held in Nelson, June 27 and 28, 2001;
- *Kootenay Lake TSA Rationale for AAC determination*, BCFS, March 1995;

- *Kootenay Lake TSA Timber Supply Analysis*, BCFS, July 1993;
- *Kootenay Lake TSA Socio-Economic Analysis*, July 1994;
- *Forest Practices Code of British Columbia Act*, consolidated to March 2001;
- *Forest Practices Code of British Columbia Act* Regulations and Amendments, current as of March 2001;
- Forest Practices Code of British Columbia Guidebooks, BCFS and MELP;
- *Kootenay-Boundary Land Use Plan (KBLUP)*, 1995;
- Kootenay Boundary Land Use Plan Implementation Strategy (KBLUP IS), 1997;
- Kootenay-Boundary Higher Level Plan Order, Final, BCFS, December, 2000;
- *Outline of Armillaria Root Disease Impacts on Timber Supplies in the Kootenay Lake TSA*, D. Norris, BCFS, May 2001;
- *A Review of the Difference Between Predicted Yield and Actual Harvest Levels in the Kootenay Lake TSA*, L. Eddy, March 1997
- *Harvest Rate Estimates for the Harrop-Procter Community Forest Proposal.* T. Bradley and D. Anderson, June 1999;
- *Kootenay Lake TSA Inventory Audit*, BCFS Inventory Branch, 1995;
- *Forest Practices Code Timber Supply Analysis*, 1996;
- *Identified Wildlife Management Strategy*, February 1999;
- *Landscape Unit Planning Guide*, BCFS and MELP, March 1999;
- *Higher Level Plans: Policy and Procedures*, BCFS and MELP, December 1996.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily

provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for the Kootenay Lake TSA, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for TSAs and TFLs. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires consistency when addressing these changes and associated uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it is necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code of British Columbia Act* and its associated regulations (the Forest Practices Code).

The *Forest Practices Code of British Columbia Regulations* were originally approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although implementation of the Forest Practices Code has been underway since the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

The eventual timber supply impacts associated with strategic land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy, and Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

In the Kootenay Lake TSA, government's approval of the Kootenay-Boundary Land Use Plan (KBLUP) in 1995, and decisions on protected areas have clarified many aspects of land and resource use and management. The Kootenay-Boundary Higher Level Plan Order was designated by Cabinet on December 22, 2000. The implementation of this Higher Level Plan will provide further certainty regarding resource management in the area.

Forest Renewal British Columbia (FRBC) has funded a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long-term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as

relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent court decisions including those in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting those obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Kootenay Lake TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

With respect to future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government. I am aware that the entire Kootenay Lake TSA has been described as an 'area of interest' by the Ktunaxa-Kinbasket First Nation. The Shuswap and Okanagan Nations have also asserted traditional territories within the Kootenay Lake TSA. Any decisions on treaty negotiations with the First Nations that are undertaken by government will be reflected in future AAC determinations for the TSA.

Overall, in making AAC determinations, I am mindful of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act* and the *Forest Act*.

The role of the timber supply analysis

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the timber supply review program.

For each AAC determination for a TSA, a timber supply analysis is carried out by BCFS staff using an information package including data and information from three categories—

land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model (Forest Stand Simulator, or FSSIM), a series of timber supply forecasts is produced reflecting different starting harvest levels, rates of change over time, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. Often termed the 'base case', this serves as a reference forecast, and forms the basis for comparison when assessing the implications of uncertainty for timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the referenced forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the reference forecast are realistic and current, and the degree to which the resulting predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current available information about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the reference forecast. Judgements that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Timber supply analysis for the Kootenay Lake TSA

The base case harvest forecast presented in the *March 2001 Kootenay Lake Timber Supply Area Analysis Report* incorporated the best available information on current forest management, land base and timber yields for the TSA. The analysis reports included specific assumptions about the TSA, and are discussed in detail in the report.

In this rationale, I will discuss many of those analysis assumptions in the context of my considerations for this AAC determination. However, where my review of an assumption has concluded that I am satisfied it was appropriately modelled in the base case, I will not discuss my considerations in detail in this document. Some factors for which the assumptions were appropriately modelled in the analysis may warrant discussion, however, for other reasons, such as a high level of public input, lack of clarity in the analysis report, or concerns resulting from the previous determination for the Kootenay Lake TSA. As a result, I may choose to provide my consideration of such factors in this rationale.

A 'base case' was generated which incorporated the factors appropriate to the TSA, and this base case was submitted for public review. In the analysis, 9000 cubic metres per year issued to woodlot licences since the 1995 determination were taken into account. As a result, the initial base case harvest level was set at 691 000 cubic metres per year, rather than the current AAC of 700 000 cubic metres.

The base case forecast projected that an initial harvest level of 691 000 cubic metres per year could be maintained for five decades followed by reductions over the subsequent two decades to the long-term harvest level of 605 000 cubic metres per year.

I have considered the parameters used to select the base case forecast, and I am satisfied that this forecast provides a suitable basis from which to evaluate the assumptions regarding land base, management practices and timber yields for the Kootenay Lake TSA. I have also considered all public input received on the data package and analysis report, and where appropriate I discuss these in my considerations under the various factors presented in this rationale.

Consideration of factors as required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area

Land base contributing to timber harvesting

- general comments

As part of the process used to define the timber harvesting land base in the timber supply analysis, a series of deductions are made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for harvest, for ecological, economic or social reasons. In the Kootenay Lake TSA, the deductions (summarized in table 2 of the *March 2001 Kootenay Lake Timber Supply Area Analysis Report*) result in a current timber harvesting land base of 257 850 hectares, or approximately 42 percent of the productive forest land.

I have considered all of the deductions applied in the derivation of the timber harvesting land base for the Kootenay Lake TSA.

Those factors associated with the derivation of the timber harvesting land base for which, based on my thorough review, I accept the assumptions applied in the analysis are not discussed below. These factors include environmentally sensitive areas, deciduous forest types, low productivity sites, and protected areas.

Where my consideration of the information has identified a factor which in my estimation requires discussion in this document, it is described below.

- inoperable areas

Those portions of the TSA which are neither physically operable nor economically feasible to harvest are categorized as inoperable, and are excluded when deriving the timber harvesting land base. For the Kootenay Lake TSA, operability mapping was originally completed in the early 1980s, with only minor modifications since that time.

A total of 192 445 hectares are mapped as inoperable, which represents approximately 31 percent of the Crown productive forest.

Two industry submissions contend that some of the areas excluded as inoperable are harvestable and should contribute to timber supply. The licensee cites examples of past harvesting in the types of stands that were excluded through the criteria applied in the analysis. Overall, they indicate that about 5 percent of recent harvesting has occurred in areas mapped as inoperable.

District staff agree that harvesting has occurred in these areas and that the current operability mapping requires some refinement. However, staff note that while some areas could be added to the timber harvesting land base, they have found some areas mapped as operable where licensees have been unable to operate. In summary, district staff believe that at the TSA level, the operability mapping provides a suitable approximation of operable areas.

I have reviewed the information regarding the exclusions applied in the analysis to account for inoperable stands. I am mindful of the difficulties associated with precisely estimating operability on a land base with such rugged terrain as that prevalent in the Kootenay Lake TSA. In some cases, staff find that harvesting occurs outside the operable land base but often this is balanced by non-performance in difficult stands or terrain currently considered operable (discussed further below, under *unstable terrain)*. Over time and with technological advances, however, it may become more feasible to operate in difficult terrain, and consistent performance in these stand types will substantiate the assumption of their contribution to timber supply in future timber supply analyses.

I recommend that if staff funding and timing permits, a thorough review of the current operability lines be undertaken, which could include various categories of operability (i.e. based on conventional versus aerial harvesting systems).

For this determination, I am satisfied that the assumptions applied in the analysis for operability represent an approximation of current harvesting performance in the TSA, and are based on the best available information. Should information become available over the term of this determination that indicates harvesting is consistently occurring outside the

mapped operable area, then I recommend that operability be reviewed and adjusted to reflect this performance for the next determination.

- uneconomic drainages

There are five drainages with potentially operable forest that were excluded from the timber harvesting land base due to the prohibitive costs of building roads into the areas. Licensees have suggested that one of these drainages – East Creek – should be considered for inclusion in the timber harvesting land base. However, until a feasible development proposal and financial commitment is provided, I believe it is appropriate to exclude these drainages from the timber harvesting land base.

- unstable terrain

The Kootenay Lake TSA contains some very rugged terrain, given its location in the Selkirk and Purcell Mountain ranges. Terrain stability mapping has revealed a number of areas within the operable land base in which timber harvesting is not likely to occur due to low economic return from poor-quality timber located on steep or highly unstable terrain. As a result, about 40 000 hectares were deducted from the timber harvesting land base.

When the timber supply analysis was completed, about half of the terrain stability mapping data was available for use. Therefore, information was extrapolated from the mapped areas and applied to unmapped areas with similar terrain. Since then, district staff have evaluated additional mapping that is now available and feel that the extrapolations were reasonable.

Several public submissions pointed out that all the area classified as terrain stability classes 'V' and 'U' should have been deducted in community watersheds, instead of a 90-percent deduction. District staff agree that it would be appropriate to exclude all of this type of area. Staff estimate that there are about 947 hectares of mapped or extrapolated class 'V' or 'U' terrain within the timber harvesting land base in community watersheds.

Several submissions also advocated different reduction levels for terrain stability classes 'V' and 'U'. In this case, however, I am guided by recommendations from district and regional staff based on their observations of current operational performance. I believe that the analysis assumptions were consistent with these recommendations.

For this determination, I am satisfied that an additional 947 hectares should be excluded, which equates to a 0.4 percent overestimation of the timber harvesting land base. The magnitude of this overestimation does not create a risk to the short-term timber supply; nonetheless, I have considered this in my determination as discussed under 'Reasons for decision'.

- unmerchantable forest types

Unmerchantable forest types are typically defined as stands which are physically operable and exceed low site criteria and yet are not currently utilized or have marginal merchantability. Typical stand characteristics may include the following: small diameter trees, few merchantable stems per hectare, or low merchantable volume per hectare. These stand types are normally excluded, in whole or in part, from the timber harvesting land base. These definitions are based on economic criteria for the purpose of defining the

timber harvesting land base, and do not imply these types are not important in terms of their role and function in the ecosystem.

A total of 12 665 hectares were identified as unmerchantable forest types, and 29 777 hectares as having low timber productivity (site index less than 8.0 metres at 50 years). However, district staff indicated that recent survey information has suggested additional unmerchantable forest types occur in overstocked, stagnant lodgepole pine types. One merchantability study in the Hawkins Creek area indicated that 2420 hectares of lodgepole pine were unmerchantable (approximately 1 percent of the timber harvesting land base).

BCFS staff also indicated that it is difficult to precisely identify and exclude unmerchantable stands for the Kootenay Lake TSA. However, in my review of this factor I questioned the appropriateness of assuming that all of the older-aged hemlock would be harvested, hence also questioned if they should be considered to fully contribute to the timber supply over time.

There are 14 690 hectares of hemlock-leading stands greater than 140 years of age in the timber harvesting land base. Of this, district staff agree that there is uncertainty about whether one half to one third (particularly in the remote Duncan River area) can be economically harvested, even under favourable market conditions. Acknowledging the range of uncertainty, I estimate that this could represent an overestimate of the timber harvesting land base of up to 2.5 percent.

I have considered the information about the analysis assumptions to account for unmerchantable forest types. The recent survey shows less performance in overstocked, lodgepole pine forest types than assumed in the timber supply analysis. The implications of this finding indicates timber supply has been overestimated by about 1 percent. In addition, I believe there is a further range of uncertainty around older hemlock types. I will take into account an overestimation of timber supply of between 0 and 2.5 percent in the short and long term to account for the likelihood that a percentage of these stands represent unmerchantable types. My considerations are discussed below, under 'Reasons for decision.'

I request that BCFS staff review and refine the definitions for unmerchantable stand types prior to the next timber supply review for the Kootenay Lake TSA.

- roads, trails and landings

In the analysis, a percentage of the productive forested area was deducted to account for the permanent loss of productive forest land to roads, trails and landings. Separate estimates were made for existing and future infrastructures to reflect both the known roads and to account for the potential changes in road building practices and road requirements over time.

1) existing roads, trails and landings

In the analysis, a total of 8833 hectares were excluded from the timber harvesting land base to account for existing mapped roads, using a Geographic Information System (GIS). This included an estimate that about 6.5 percent of the timber harvesting land base with a

logging history (forest stands younger than 70 years) was considered occupied by existing trails and landings. However, after completion of the analysis it was discovered that 7.5 percent was inadvertently used in the base case.

To determine the area, it was assumed that 30 percent of the existing logging roads would be permanent (a 16-metre permanent right-of-way) and 70 percent would be temporary (a 7-metre right-of-way). However, district staff indicate that the permanent versus temporary status of some roads is uncertain. Licensees often keep roads open within their operating areas in order to maintain options for future harvesting, forest health issues, and salvage operations.

Licensee staff questioned the averaged right-of-way widths assumed in the analysis, indicating that an assumed width of 16 metres for logging roads is excessive. They cite an internal assessment that showed widths of 11 metres on slopes less than 30 percent, and 13.6 metres on slopes of 55 percent.

Several public submissions noted the reductions to account for existing roads, trails and landings were considerably less than those used in the previous 1995 timber supply review (TSR 1). They also note that the existing methodology does not account for unmapped roads.

District staff suggest that an additional 616 hectares or 0.2 percent of area should be included in the timber harvesting land base to account for the difference between the district's estimate of 6.5 percent and the 7.5 percent inadvertently used in the base case.

Having considered the information, for this determination, I have accounted for a slight underestimation of timber supply of 0.2 percent in the short to long term, as discussed below under 'Reasons for decision.' To address the uncertainties around permanent and temporary status, I recommend that district staff complete field examinations prior to the next determination to provide more accurate estimates.

2) future roads, trails and landings

There were 7280 hectares deducted to account for future productivity losses associated with future roads, trails and landing construction. The deduction was based on a similar accounting to that used for existing roads, trails and landings, except the deduction was applied to stands older than 70 years of age.

Several public submissions point out that future roads will often have to climb into steeper terrain that will require wider right-of-ways. They suggest future roads, trails and landings should reduce the timber harvesting land base by 11 percent.

District staff believe that the methodology used and the factors applied provide a reasonable reflection of expected productivity losses based on current skidding and landing construction practices. Staff indicate that minimizing soil damage is a high priority in the TSA.

I have considered the information about the accounting in the analysis for future roads, trails and landings. I note that if data indicates that harvesting and road construction activities result in a greater or lesser impact to site productivity, this will be reflected in future analyses. For this determination, I accept the analysis assumptions.

- timber licence and agreement lands

Timber licence and agreement lands held by Slocan Forest Products Ltd. are expected to expire before February 2004, after which 1200 hectares will revert to Forest Service jurisdiction. Reforestation is current on the harvested areas, but it is noted that 325 hectares of mature forest were included in the assumed reversion of these tenures in deriving the timber harvesting land base. In practice, this area should not contribute to the timber harvesting land base until after it has been harvested under the current tenures, which are currently due to expire prior to 2004.

This represents about a 0.13-percent overestimation of the timber harvesting land base in the short term. I have accounted for this slight overestimation of timber supply as discussed below, under 'Reasons for decision.'

- woodlot licences

Section 8 of the *Forest Act* requires that AACs determined for TSAs be exclusive of the area and timber volume issued to woodlot licences. The base case appropriately accounted for a volume of 9000 cubic metres per year, which is approximately the amount issued to woodlots since the 1995 determination.

However, the woodlot licence areas were based on an overlay that was slightly out-of-date. The overlay showed a few woodlots that have not actually been awarded. This resulted in about 1000 hectares being incorrectly removed from the timber harvesting land base, and consequently the timber harvesting land base was underestimated by about 0.4 percent. I have accounted for this as discussed below, under 'Reasons for decision.'

- community forest tenures

To project timber supplies for TSAs, area-based community forests are also excluded in a similar manner as woodlot licences. There are currently three community forest tenures in the Kootenay Lake TSA. Two of these (Kaslo and Creston) are volume-based non-replaceable forest licences, while the third (Harrop-Procter Community Forest Pilot Project) is an area-based tenure. The two volume-based tenures will continue to be part of the timber supply for the TSA, however the Harrop-Procter Community Forest no longer contributes to the TSA's timber supply.

In 1999 prior to awarding the Harrop-Procter pilot, an evaluation was conducted to estimate a harvest level based on the TSR base case assumptions. The evaluation indicated a projected harvest level of 9700 cubic metres per year from the Harrop-Procter pilot area. The base case forecast did not exclude the pilot area. As required by Section 8 of the *Forest Act*, the area-based community forest should not contribute to the timber supply for the TSA, and hence accounting for the removal of this area reduces the harvest level by 9700 cubic metres per year. I have accounted for the Harrop-Procter area as discussed below under 'Reasons for decision'.

I acknowledge suggestions that the Kaslo and Creston community forests could become area-based tenures in the future, and if this happens, the implications will be factored into subsequent timber supply analyses.

Existing forest inventory

The inventory data used for the timber supply analysis was based on forest inventories initially completed in 1969 for the Lardeau Public Sustained Yield Unit (PSYU), and in 1973 for the Creston PSYU. In 1995, a BCFS Inventory Audit was conducted to assess the overall accuracy of the current forest inventory, and concluded that it was reasonably accurate. In preparation for the timber supply analysis, the inventory file was updated to January 1, 1998 to account for changes in ownership, forest growth, and denudation through harvesting or wildfire.

I note that this determination is occurring almost four years into the first decade of the planning horizon. This indicates that the short- to mid-term timber supply may be more sensitive to those factors exerting either downward or upward influences than suggested by the various sensitivity analyses.

District staff have indicated that a complete re-inventory is scheduled to occur between 2001 and 2003. I support completion of this important project prior to the next AAC determination.

For this determination, I have considered the information about the forest inventory and am satisfied that the best available information was used in the analysis.

- volumes estimates for existing stands

As mentioned under Existing forest inventory, an inventory audit was completed in 1995. The audit found that volume estimates are acceptable for mature existing stands.

I note that the regional pathologist has expressed concern regarding timber supply impacts of *Armillaria ostoyae* (armillaria) root disease in certain existing stands, due to species conversion. However, at this time the extent of this is largely unquantified. I note that an overestimate of existing stand volumes was not observed in the inventory audit. At this time, I accept the findings of the inventory audit that existing stand volumes are acceptable, and I do not make any adjustments on this account.

I have also discussed armillaria root disease further below, under *volumes estimates for regenerating stands*.

Expected rate of growth

- site productivity estimates

Inventory data includes estimates of site productivity for each forest stand. Site productivity is expressed in terms of a site index, which is based on the stand's height in metres at 50 years of age. The productivity of a site largely determines how quickly trees grow, which in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the age at which a stand will reach a merchantable size.

In general, in British Columbia, site indices determined from younger stands (i.e. less than 31 years old), and older stands (i.e. over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather,

stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where studies—such as the Old-Growth Site Index (OGSI) 'paired plot' project and the 'veteran' study—as well as results from using the Site Index Biogeoclimatic Ecosystem Classification System (SIBEC) suggest that actual site indices may be higher than those indicated by existing data from old-growth forests. Such studies suggest that site productivity has generally been underestimated by the inventory file data; managed stands tend to grow faster than projected by inventory-based site index estimates from old-growth stands. In the Kootenay Lake TSA, results of these studies only apply to stands older than 140 years of age, which comprise 19 percent of the timber harvesting land base.

No local site index studies have been conducted in the Kootenay Lake TSA. Sensitivity analysis was used to assess the impact to timber supply if site productivity is underestimated to the extent suggested by the OGSI studies. In the sensitivity analysis, the site indices of stands older than 140 years of age were adjusted using the provincial OGSI data. For lodgepole pine and interior spruce, adjustments were based on paired-plot data; for all other species, adjustments were based on veteran-tree study data. The sensitivity analysis indicated that when the provincial OGSI site productivity adjustments were applied, the long-term harvest level was 11 percent higher than in the base case.

Licensees indicated that they are consistently finding higher site indices in the field than are identified on forest inventory maps. The Kootenay Centre for Forestry Alternatives, on the other hand, stated that potential gains from genetic improvement and OGSI are highly speculative, with little or no local data, and that consideration of these factors should await future determinations.

While I acknowledge that there is uncertainty related to the ultimate performance of stands relative to their potential, data from the OGSI studies clearly demonstrates that actual stands throughout the province are growing at a much faster rate than would be expected based on measurements from the existing old growth inventory. Given existing silvicultural requirements, it is reasonable to expect that full stocking will occur in the majority of managed stands in the Kootenay Lake TSA, and that the stands will be managed to minimize losses to pests and competing vegetation. Therefore, while the exact magnitude of the productivity increase is not certain, I believe it is highly reasonable to expect that most second-growth stands will grow more quickly than productivity estimates from old-growth stands would suggest. In this determination, I have considered the implications of underestimating site productivity, and that subsequently the mid- to long-term timber supply may be higher than projected in the base case. I will discuss my considerations of this further under 'Reasons for decision'.

I note that local data will provide much needed certainty around the magnitude of site productivity adjustments appropriate for the Kootenay Lake TSA, and I strongly encourage the collection of data from stands within the TSA over the term of this determination.

- volume estimates for regenerating stands

For the Kootenay Lake TSA timber supply analysis, the Table Interpolation Program for Stand Yields (TIPSY) was used to estimate the growth and yield of all future regenerated stands. Projected volume gains expected from the use of improved seed were not included in the base case. Operational adjustment factors (OAFs) were applied to adjust the projected yields generated from TIPSY to reflect operational conditions.

The operational adjustment factors applied to all managed stands were 15 percent for OAF 1 (a reduction to account for incomplete site occupancy, or small gaps in a stand), and 7 percent for OAF 2 (a reduction to account for pest, disease and decay losses). The OAF 2 reduction is slightly higher than the typical provincial estimate of 5 percent. An additional 2 percent reduction was applied to account for estimates of *Armillaria ostoyae* (armillaria) root disease losses.

A draft report completed by the regional pathologist indicates that the impacts of armillaria may be underestimated in the base case. Reported impacts of armillaria include reduced height and diameter growth and increased mortality, which can then result in lower stand volumes, lower rates of green-up, and affect species conversion. The reported losses in infected stands range from 13 to 26 percent. Douglas-fir is the most susceptible species. Douglas-fir leading stands account for 18 percent of timber harvesting land base.

To examine the magnitude of this potential loss of timber supply, a sensitivity analysis was conducted with an OAF 2 of 20 percent across all species. The sensitivity showed there was no impact to timber supply for the first 50 years, however the mid- to long-term harvest level was 10 percent lower. While the regional pathologist has noted the growth response to armillaria varies greatly depending on species, biogeoclimatic location, and growing conditions, the sensitivity analysis serves to identify an upper limit on losses that that might be expected for the TSA. Several public submissions emphasized the potential impact of armillaria, and pointed out that climate change would likely cause forest health problems to increase.

I acknowledge that the timber supply analysis has likely underestimated the impact of armillaria root disease, particularly with regard to growth projections of Douglas-fir in the mid to long term. It is difficult to accurately quantify this impact; however, in consideration of the size of the area of timber harvesting land base occupied by Douglas-fir leading stands, application of an average volume reduction of 20 percent to these stands could potentially reduce the mid- to long-term timber supply by about 3.6 percent.

For this determination, I have considered this uncertainty as discussed below, under 'Reasons for decision'. I strongly encourage continued research into the impacts of armillaria root disease, and the development of possible mitigative strategies prior to the next determination.

- minimum harvestable ages

A minimum harvestable age is an estimate of the earliest age at which a forest stand has met minimum merchantability criteria. In practice, many forest stands may be harvested

beyond the minimum harvestable age due to constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the analysis for the Kootenay Lake TSA, minimum harvestable ages for stands were determined based on the age at which stands reached 95 percent of the culmination of mean annual increment. The ages ranged from 50 to 130 years for natural stands, and from 60 to 150 years for managed stands. District staff indicated that these ages generally seem reasonable based on current harvesting practices in the TSA, but noted instances of harvesting below this criterion, due to factors such as forest health.

Sensitivity analysis was used to assess the timber supply implications of increasing or decreasing minimum harvestable ages. The results indicated that reducing or increasing the minimum harvestable ages by 10 percent had no impact on the base case forecast for 6 decades. However increasing the ages by 10 percent reduced the long-term harvest level by 5 percent to 575 000 cubic metres per year. Decreasing the ages by 10 percent increased the long-term harvest level by 10 percent to 665 000 cubic metres per year.

It is always difficult to precisely estimate minimum harvestable ages, as to some extent it requires an estimation of future preferences and markets. I have considered the information regarding minimum harvestable ages, and I accept that the assumptions applied in the analysis are an appropriate reflection of current practice. However, I encourage district staff to continue to review the criteria to ensure that they represent operational considerations over time.

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

Expected time for forest to be re-established following harvest

I have reviewed the information regarding regeneration, regeneration delay, impediments to regeneration and not-satisfactorily-restocked areas. Several public submissions questioned the assumption that all plantations would succeed, and that only a 2- to 3-year regeneration delay was expected for successful reforestation. District staff confirmed that portions of plantations have occasionally failed (perhaps 15 percent of total planted area), but prompt re-planting has generally corrected this situation. Therefore, in cases of unsuccessful regeneration, the delay period could be approximately 0.2 years longer, on average.

Additionally, district staff report that there is a level of black bear damage in pruned and spaced plantations — 136 hectares in 1999 and 490 hectares in 2000. In the southern part of the TSA there are about 610 hectares of spaced and/or pruned plantations that are most at risk. Some mortality within the plantations has been observed (23 percent of surveyed trees were damaged), but the final growth and yield implications are unknown at this time.

With regard to non-satisfactorily restocked (NSR) areas, district staff have advised me that 679 hectares, which were assumed to be restocked in the base case, are unlikely to achieve full stocking because of reduced funding and opposition to herbicide use. Staff estimate that up to half of the volume projected for these 679 hectares could be lost over time.

I am aware of the concerns about longer regeneration delays, some mortality due to black bears, and lower stocking in some NSR areas. However, I have examined a sensitivity

analysis that tested a 10-percent volume reduction to all managed stands, the results of which showed no short-term impact. For this determination, given the relatively small impact I would expect from these factors in combination, as well as noting there is no short-term sensitivity to a 10-percent reduction to managed stand volumes, I have made no adjustments on this account.

Any information that can be gathered prior to the next timber supply analysis to quantify the timber supply impact would be helpful and will be included in the next determination.

(iii) silviculture treatments to be applied to the area,

Silvicultural treatments to be applied

I have reviewed the information regarding commercial thinning and incremental silviculture, and I am satisfied that the base case assumptions for these factors were appropriate.

With regard to silvicultural systems, district staff estimate that up to 15 percent of the harvesting in the TSA is carried out by partial cutting. Partial cutting generally leaves about 10 percent of the volume standing (residual trees) after harvesting. On some areas, the residual trees may be harvested in the future, but in most cases this is unlikely to occur until the next harvesting rotation. As discussed under *stand level biodiversity*, staff note that volumes were reduced by 2.2 percent on all stands in the analysis to account for wildlife trees and patches. However there was no specific accounting for partial harvesting in the base case.

I acknowledge there are concerns about the operational feasibility of re-entry into partially cut areas, and also that there are important non-timber resource values in the Kootenay Lake TSA that may result in additional trees left on-site. Staff estimate that in addition to the 2.2 percent reduction applied in the analysis to account for wildlife trees and patches, an accounting for the leaving of these residual trees potentially represents a further volume reduction of about 1.5 percent, which affects the short- and long-term timber supply.

I understand there is considerable interest from the public to increase the use of partial cutting systems. I encourage district and licensee staff to use innovative tools, given careful planning to minimize losses of the available timber in the TSA, while maintaining objectives for other resource values.

For this determination, as current levels of partial cutting were not accounted for in the analysis, I accept that timber supply has been overestimated by up to 1.5 percent in the short and long term, which I have considered as discussed below, under 'Reasons for decision.'

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

Utilization and decay, waste and breakage

I have reviewed the information regarding the utilization standards and the decay, waste and breakage factors assumed in the analysis for the Kootenay Lake TSA, and I am satisfied that these factors were appropriately modelled.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply they must be considered in AAC determinations.

To manage for resources such as water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and amount of disturbance (areas covered by stands of less than a specified height), and prescribe minimum green-up heights for regenerated stands on harvested areas before adjacent areas may be harvested. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

In the timber supply analysis, as described in the *March 2001 Kootenay Lake Timber Supply Area Analysis Report*, several management zones were developed with different forest cover constraints applied in each zone. These management zones—licensed watersheds, visual quality, ungulate winter range, mountain caribou, and integrated resource management—reflect different operational considerations.

I have reviewed the information regarding the assumptions that reflect the management of non-timber resources. For the most part, I believe that the analysis has appropriately reflected operational constraints associated with existing management practices. I am also satisfied that, with the exception of areas noted in the following sections, that the assumptions regarding these factors in the analysis are consistent with the Kootenay-Boundary Higher Level Plan Order. The factors discussed below are those for which I believe my considerations require some detailed explanation.

- cutblock adjacency/green-up/patch size

Objectives for forest cover and cutblock adjacency guide harvesting practices in order to address resource values such as wildlife, water, and visual quality. The FSSIM timber supply analysis does not model adjacency explicitly. Rather in the analysis, adjacency is modelled implicitly through a forest cover constraint that limits the amount of area on which trees may be below a specified green-up height. The adjacency objectives modelled in the Kootenay Lake analysis limit a maximum of 33 percent of the stands in the integrated resource management zone to be less than green-up height of 2.0 metres, before an adjacent area could be harvested.

At present, the Kootenay Lake district and licensee staff are implementing variable harvest patch sizes, consistent with the *Landscape Unit Planning Guide* and the KB Higher Level Plan Order. This is generally recognized as a significant improvement over rigid adjacency rules and small cutblocks (less than 40 hectares), and can result in greater operational flexibility in the short term. Staff advise me that the adjacency objectives applied in the

integrated resource management zone (65 percent of timber harvesting land base) have not significantly limited the timber supply in the short to long term. For this determination, I do not find it necessary to adjust the assumptions for adjacency applied in the base case.

- recreation

The forests in the Kootenay Lake TSA are used for a variety of recreational pursuits by local residents as well as tourists. Activities include downhill, cross-country, heli- and backcountry skiing, snowmobiling, hiking, and camping, as well as boating and fishing.

In the TSA, harvesting is typically restricted around recreation sites and along some recreation trails. The majority of the recreation sites are classified in the forest inventory as environmentally sensitive area (ESA), with a 1-r designation. To reflect harvesting restrictions in these areas, a reduction of 50 percent was applied to the ESA 1-r areas, with the exception of several landscape units. In these units, an accounting was already applied for visual quality objectives and riparian areas, and therefore no further reductions were applied for recreation.

Having considered the information and discussed it with district staff, I accept that the assumptions in the analysis for recreational values was reasonable, and make no adjustments on this account.

- caribou habitat

I have reviewed the provisions in the analysis for caribou habitat. The caribou habitat zone covers about 23 percent of the timber harvesting land base, and the requirements applied closely approximate the direction in the KB Higher Level Plan Order. However, in part of the Caribou – ESSF zone, there is an additional requirement under the order that at least 20 percent of the area be harvested using partial cutting prescriptions to maintain suitable caribou habitat attributes.

As discussed earlier in *silvicultural systems*, district staff note that partial harvesting is occurring in the TSA. I am taking into account in this determination the implications to timber supply of the current level of partial harvesting in the TSA. However, it is uncertain how much additional accounting may be required to reflect the timber supply implications of future partial cutting in the caribou zone. I recommend that district staff monitor the future use of partial harvesting to meet these objectives, so that in future timber supply analyses, this requirement can be explicitly reflected in the base case.

- ungulate winter range

To account for managing areas that are critical for winter use (ungulate winter range) by deer, elk and moose, an averaged forest cover requirement was applied in the base case. The requirement was a minimum of 40 percent of the timber harvesting land base in the ungulate winter range (UWR) zone was to be covered with trees at least 81 years of age, at any time.

District staff indicate that the constraints applied in the analysis reasonably represent the species-specific constraints applied operationally to manage for mature forest cover, and as

well are consistent with the intent of the KBLUP. The Kootenay-Boundary Higher Level Plan Order did not address UWR provisions.

However, district staff have informed me that mapping revisions to the ungulate winter range, now in effect, have reduced the amount of timber harvesting land base included in the ungulate winter range zone. The zone now includes 15 percent (8686 hectares) less timber harvesting land base than modelled in the base case. It is difficult to accurately quantify the timber supply impact of this change, however it likely represents a very small upward pressure on timber supply in the long term. For this determination, I have considered this upward pressure as discussed below, under 'Reasons for decision'.

- identified wildlife

Under the *Forest Practices Code of British Columbia Act*, identified wildlife are those wildlife species that have been approved by the chief forester and (former) deputy minister of Environment, Lands and Parks or designate as requiring special management. The province's Identified Wildlife Management Strategy (IWMS) for dealing with endangered, threatened, vulnerable, and regionally significant species which have not been accounted for with existing management strategies—such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints—was announced on February 19, 1999.

Volume I of the IWMS lists several species which may occur and require future consideration in the TSA, including the following: bull trout, rubber boa, American bittern, northern goshawk, prairie falcon, sandhill crane, long-billed curlew, Lewis's woodpecker, bobolink, fisher, grizzly bear, mountain goat, and bighorn sheep. Volume II, which has yet to be released, may identify additional species. The species identified in Volume I will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures (GWMs), or through other management practices specified in higher level plans. The analysis did not explicitly model any requirements for identified wildlife.

Based on data accumulated on the habitat requirements for the identified species, the estimated impact of management was projected at one percent of the short-term harvest level for the province. Government has committed to limiting the impact of management for identified wildlife to this level in the short term.

Staff advised me that the establishment of one northern goshawk WHA has been initiated. However, beyond this one WHA, it is not possible in this determination to specify the exact location or precise amount of habitat area that will be required within the timber harvesting land base to implement the IWMS. However, given the Province's commitment both to implement the IWMS, and to limit short-term timber supply impacts to one-percent province wide, as well as the expected occurrence of identified wildlife in this TSA, I find it appropriate to account for a one percent impact on timber supply, and I will discuss this further under 'Reasons for decision.'

I encourage the appropriate staff to establish WHAs and implement GWMs prior to the next determination for the Kootenay Lake TSA. The establishment of these areas is an

important protective measure and will assist with long-term planning and reduce operational conflicts between the management of wildlife habitat and timber harvesting.

- grizzly bear habitat

Although the grizzly bear has now been identified as a species covered by the IWMS, the development of management requirements for grizzly bear habitat has been underway for a number of years in the Kootenay Lake TSA.

The 1995 KBLUP contained recommendations for the management of grizzly bear habitat. These provisions are adhered to in current practice for the approval of operational plans. The provisions include management of habitat adjacent to avalanche tracks and management of access and road densities in critical drainages. The Kootenay-Boundary Higher Level Plan Order also contains provisions regarding grizzly bear habitat. However, BCFS staff do not anticipate additional timber supply impacts to those already included in the base case for biodiversity, including the target retention levels for old and mature forest. Therefore, no specific constraints were applied in the timber supply analysis to account for grizzly bear habitat.

I have reviewed the information regarding grizzly bear habitat. Staff report that for the most part, habitat requirements can be met through the retention for old and mature forest, in conjunction with old-seral requirements in areas with low biodiversity emphasis and in connectivity corridors, all of which are consistent with the Kootenay-Boundary Higher Level Plan Order and current operational practice. As discussed below, under *landscape-level biodiversity*, the analysis is in accordance with the above parameters as contained in the higher level plan. For this determination, I am satisfied that there are no further adjustments required to reflect current management of grizzly bear habitat.

- Midge Creek Wildlife Management Area

This management area was established by an order-in-council on April 6, 1998. It is located on the west side of the south arm of Kootenay Lake. The total timber harvesting land base contribution from this area is 4476 hectares.

The area is now managed by the Ministry of Water, Land, and Air Protection (MWLAP), with emphasis on mountain caribou and grizzly bear conservation. In July 2000, there was joint approval—between MWLAP (previously MELP) and the Forest Service—granted to allow harvest of 430.8 hectares. However beyond this approval, there are no other management plans currently in place, and therefore any wildlife management objectives that might impact timber supply are uncertain.

Prior to the next AAC determination, I recommend that staff strive to complete management objectives and strategies for this area in order to quantify any potential timber supply impact. In the meantime, given the evidence that at least some level of harvesting is taking place in this area, I consider it reasonable to consider the ongoing contribution of this area to the timber harvesting land base.

- community and domestic watersheds

The Forest Practices Code provides definitions and management considerations for community watersheds. The Kootenay Lake TSA contains 59 designated community watersheds, and portions of these watersheds comprise 9.6 percent of the timber harvesting land base. Additionally, there are several hundred domestic watersheds (consumptive-use watersheds described in Section 3.7.2.b of the KBLUP Implementation Strategy) which cover 27.4 percent of the timber harvesting land base.

In operational practice for all community watersheds, hydrologists in the Nelson Forest Region complete assessments—using the *Interior Watershed Assessment Procedure Guidebook*—to determine whether planned operations can be conducted without detriment to water quality resources. The watershed assessment procedures (WAPs) consider the cumulative effects of planned operational activities on the aquatic environment. Given the proposed activities, the assessments evaluate the following potential outcomes: changes to peak streamflows; accelerated landslide activity; accelerated surface erosion; channel bank erosion; or changes to the channel structure. An evaluation of the interaction of these potential outcomes provides an indication of the sensitivity of the watershed to further disturbance. Using the results of a watershed assessment, forest managers make recommendations concerning the amount and method of further harvesting in the watershed. A key component of watershed management includes the calculation of equivalent clearcut area (ECA), which is the area within the watershed that has already been disturbed by harvesting or wildfire, with consideration given to the silvicultural systems being employed and the existing extent of second-growth forests. The ECAs provide an important threshold value that triggers the need to develop a more detailed assessment before further harvesting is permitted.

District staff have advised me that the "recommended maximum ECA" values included in watershed assessments are often interpreted by water users and others to mean an absolute limit on harvesting. In the timber supply analysis, forest cover requirements were applied to community and domestic watersheds to approximate the constraints used in current practice to control hydrological recovery rates. These varied depending on type and size of watershed - no more than 15, 20, or 25 percent of the forest in the watersheds was permitted to be less than 6 metres in height at any time. The 6 metre height used in the analysis reflects half of the full hydrological recovery condition for stands, and is based on current knowledge about watershed dynamics and hydrological recovery rates. For the purpose of timber supply analysis, in community watershed a maximum of 20 percent of stands were permitted to be below a green-up height of 6 metres. This approach to disturbance limits is a proxy for ECA values, however, at the field level watershed-specific factors are considered.

District staff have advised me that the KB HLP Order identifies provisions for consumptive-use streams, which are designed to reduce the impacts of forest development on some streams by increasing the streamside management zone (for S5 and S6 streams) above water intakes licensed for human consumption. District staff anticipate completion of the consumptive-use stream mapping in 2002. Currently, intake mapping is incomplete and therefore no constraints were applied in the analysis for these provisions.

The Queens Bay Residents Association submitted that while some harvesting has occurred in previously deferred watersheds, the level of harvest suggested by the watershed guidelines has not been accomplished, and reductions in harvest levels should be accounted for in the analysis. A submission from the Kootenay Centre for Forestry Alternatives noted the constraints modelled appear to be consistent with current practice, but given increasing awareness about water suggested that constraints may increase, creating a downward pressure on timber supply. The Kootenay Lake Forestry Association stated that watershed ECAs are too conservative, given the generally accepted position that ECAs are only one of a number of indices for watershed condition.

I acknowledge the concerns expressed by water users and other public groups with regard to timber harvesting and road development within licensed watersheds. I am aware that this issue is often contentious within the Kootenay Lake TSA. District staff have indicated that the base case assumptions are consistent with current management, with the exception that further harvesting in some watersheds continues to face opposition. In some instances, due to the historic location of human settlements on alluvial fans (i.e. stream deltas), these settlements are susceptible to flooding during higher than average peak water flows. Also, logging practices on private land within these same watersheds has increased the pressure to reduce harvest levels on Crown-owned land. I note that the existing watershed guidelines have been developed to minimize the potential for increasing peak flows. Until there is a land-use decision by government that provides additional direction regarding these watersheds, then they continue to be part of the timber harvesting land base and managed by provincial guidelines.

A sensitivity analysis, which examined a reduction of the permissible harvest limits by five percentage points in domestic and community watersheds, showed that the initial harvest level could be maintained for four decades, not five decades as projected in the base case. Although this sensitivity analysis does not indicate a significant impact to the timber supply in the short term, I note that the community and domestic watersheds account for about 37 percent of the timber harvesting land base. Their long-term contribution to the timber supply of the TSA is extremely important and I urge all stakeholders to work cooperatively to ensure continued integrity of these watersheds through careful and well-planned operations.

I have reviewed the information regarding the assumptions for community and domestic watersheds. I am mindful of the difficulties involved with incorporating operational considerations for management in watersheds into timber supply analysis, and believe that the constraints applied in the Kootenay Lake analysis—which were derived from careful background analysis and documentation—are reasonable. I am satisfied that management considerations for community and domestic watersheds have been appropriately reflected in the analysis.

- riparian management

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting, in order to protect riparian and aquatic habitats. For a stream, lake or wetland, the RMZ and RRZ

make up the entire riparian management area. For streams, stream classes (e.g., S1) described in the *Riparian Management Area Guidebook* are determined based on presence of fish, occurrence in a community watershed and average channel width criteria. The stream class is used to estimate the area required to be retained in the RRZ and the area or volume required to be retained in the RMZ. Similar criteria are used to classify and estimate RRZ and RMZ retention rates for lakes and wetlands.

In reviewing the assumptions applied in the Kootenay Lake analysis, staff found they had underestimated the volume to be retained in RMZs. This volume was estimated to be equivalent to about 683 hectares. This represents a 0.3-percent overestimation of the timber harvesting land base in the short to long term.

Several submissions suggested that current riparian management standards are inadequate and that reserves should be increased. Other submissions pointed out that the Watershed Atlas (the source of the stream classifications) does not include many of the smaller streams. Staff note that these smaller streams do not generally preclude timber harvesting and therefore do not likely represent a risk to timber supply. District staff confirm that in the field, riparian areas are being managed to the standards required by the Forest Practices Code.

For this determination, I am satisfied that an additional 683 hectares should be excluded to fully reflect management in RMZs, which equates to a 0.3 percent overestimation of the timber harvesting land base. For this determination, I have considered this overestimation as discussed under 'Reasons for decision'.

- stand-level biodiversity

Biodiversity is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at both the stand and landscape levels. Stand-level biodiversity management includes retaining wildlife tree patches (WTPs), within or adjacent to cutblocks to provide structural diversity and wildlife habitat.

In the public input, an individual stated that the WTPs requirements in the analysis are too low and should be based on Table 20b since biodiversity emphasis objectives have not been established. If Table 20b were applied, wildlife tree retention would be an average of approximately 2.9 percent.

For the timber supply analysis, a 2.2-percent volume reduction was used based on Table 20a of the *Biodiversity Guidebook*. District confirmed this is appropriate because landscape unit boundaries and biodiversity emphasis option (BEO) designations have been established, and final landscape-unit objectives are expected to be in place within 2 years. Furthermore, I note that the attainment of landscape unit objectives was modelled and accounted for in the timber supply analysis, which further validates the appropriateness of basing the wildlife tree requirements on Table 20a.

I note that government intentions are clear with regard to establishment of old growth management areas and wildlife tree patch requirements. Within two years, it is expected

that landscape-unit objectives will be in place for these factors. For this determination, I accept that stand-level biodiversity has been accounted for in the analysis consistent with provincial policy, and will make no further adjustments in this regard.

- landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that this—together with other provisions in the Forest Practices Code, such as riparian management, maintenance of wildlife trees, and other forest cover objectives as discussed throughout this document—will provide for the habitat needs of most forest organisms. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

The delineation and formal designation of 'landscape units' is a key component of a sub-regional biodiversity management strategy. For the Kootenay Lake TSA, landscape unit boundaries and biodiversity emphasis option (BEO) designations were established by the district manager in July of 1998.

I have reviewed the assumptions made to account for landscape level biodiversity in the analysis for the Kootenay Lake TSA, and am satisfied that the assumptions appropriately reflect the provincial policy direction for achieving landscape-level biodiversity requirements provided in the *Landscape Unit Planning Guide*, as well as in the established Kootenay-Boundary Higher Level Plan Order. My consideration of those assumptions for which I believe some further discussion is required in this document is detailed below.

1) seral stage requirements

The 1995 KBLUP provided recommended target requirements for old and mature seral forest, and these requirements are also reflected in the HLP. Current management for landscape-level biodiversity in the Kootenay Lake TSA includes provision for the maintenance of mature forest as well as old-growth forest.

Requirements for both mature and old forest were modelled in the timber supply analysis. The forest cover requirements were applied at the biogeoclimatic variant level within each landscape unit as a minimum percentage of the productive forest land base which must be retained in stands meeting the requirements for mature and old forest.

The *Landscape Unit Planning Guide* permits old forest requirements for areas with low BEOs to be met within three rotations, and describes no mature forest retention requirements for these areas. The direction in the Kootenay-Boundary Higher Level Plan Order requires both mature and old seral retention in low BEO areas. The full mature seral forest requirements are to be met immediately while the old requirements may be phased in over three rotations. This approach was reflected in the timber supply analysis for the Kootenay Lake TSA. Consequently, I am satisfied that the base case assumptions reasonably approximate the requirements of the *Landscape Unit Planning Guide* and the KB HLP.

In high and intermediate BEO areas, current provincial policy direction from the *Landscape Unit Planning Guide* requires old seral requirements to be met immediately. If it is not possible to immediately achieve targets in these areas, then Old Growth Management Areas (OGMAs) are designated in mature forested areas to recruit old-growth forest. The Kootenay-Boundary Higher Level Plan Order contains recommendations for formal establishment of these areas, and prioritizes the areas from which the mature plus old requirements are to be met in a different manner than provincial policy in order to meet specific objectives, such as connectivity.

OGMAs have not yet been formally delineated in the Kootenay Lake TSA. However, old-growth patch inventories have been completed and an interim strategy is in place to guide forest development planning. The Valhalla Society pointed out that many landscape units are presently in deficit of old-growth. District staff confirm that approximately 90 percent of the landscape units in the Kootenay Lake Forest District are presently in deficit of full old-growth requirements. District and Timber Supply Branch staff believe that the modelling assumptions for recruitment of old growth from the timber harvesting land base and from the non-contributing forests are a reasonable approximation of the interim old growth strategy.

Connectivity was not explicitly modelled, but district and regional staff advise me that the impacts of this will likely remain unknown until final deployment of OGMAs and mature forest requirements. In any case, staff note that since old growth requirements have been accounted for, there are likely to be no additional timber supply impacts due to connectivity.

In summary, I have reviewed the information, and for this determination I have found the base case assumptions to be a reasonable reflection of the intent of the KBLUP, as well as the Kootenay-Boundary Higher Level Plan Order.

2) ageing of the non-contributing productive forests

In the Kootenay Lake analysis, productive forests that were not included in the timber harvesting land base were assumed to continually age such that all these forests were eventually over 250 years of age. Therefore, no allowances were made for the possible influences that natural stand disturbances such as fire, insects or disease may have on these areas over time. In terms of landscape-level biodiversity, the implication is that a larger proportion of the old seral requirements are met in the future by non-contributing forests in the modelling than may be realized operationally.

In the TSA, historical natural disturbance patterns are such that infrequent, but large wildfires affected the age class structure of the non-contributing productive forests. District and Timber Supply Branch staff agree that while it is difficult to model future uncertain disturbance events, the continual ageing of the non-contributing productive forest as modelled in the base case is not a realistic expectation or likely outcome.

A number of submissions from the public expressed concerns about the validity of the ageing assumption. The Queens Bay Residents Association and the Kootenay Centre for Forestry Alternatives submit that the assumption of continuous ageing is incorrect, and suggest that a static age class distribution might better reflect present management.

I have reviewed the assumptions regarding the ageing of non-contributing forests in the analysis and it is clear that in the Kootenay Lake TSA these forest types will experience future disturbances. As a result, the future contribution of these forests to meeting old-seral biodiversity objectives has likely been overestimated in the analysis. For this determination, I have accounted for this overestimation as discussed below, under 'Reasons for decision'.

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

Kootenay-Boundary Higher Level Plan Order

Portions of plans arising from strategic land use planning processes such as regional or subregional planning (land and resource management planning) may be declared as higher level plans under the Forest Practices Code. A higher level plan defined under the Forest Practices Code establishes government's social, economic and environmental objectives, thereby setting the resource management context for developing subsequent operational plans.

For the West Kootenay area, the Kootenay Boundary Land Use Plan (KBLUP) was completed and signed off by government in 1995. The Kootenay-Boundary Higher Level Plan Order, containing critical components of the KBLUP, was established by government in December 2000.

The majority of the recommendations arising from the KBLUP, and also contained within the higher level plan, that are relevant to operations and timber supply have been implemented in the Kootenay Lake TSA and form part of current practice for operations in the area. As discussed previously in this document, the timber supply analysis assumptions for wildlife habitat, landscape-level biodiversity, riparian habitat, watersheds, visual quality and other IRM values were consistent with the plan.

The Kootenay-Boundary Higher Level Plan Order was not all-inclusive, and some provisions which arose from implementation of the KBLUP were not included in the higher level plan, either because they were already satisfactorily addressed by the Forest Practices Code (which was implemented after the 1995 KBLUP), because they did not affect operational or strategic planning and were determined to be handled through other means, or because the provisions were determined by government to result in unacceptable socio-economic impacts.

I am aware that current practice in the Kootenay Lake TSA is guided by the recommendations arising from the KBLUP. The majority of these recommendations were used in the development of the assumptions for the 2001 timber supply analysis. I believe that this period following government's establishment of the Kootenay-Boundary Higher Level Plan Order will provide greater clarity around the management for specific resource values in the Kootenay Lake TSA. If, during the period following the establishment of the higher level plan, management considerations for specific values become less or more constraining than those which guided current practice between the KBLUP and the higher level plan order, then this can be factored into a future determination. In the meantime, I am satisfied that this determination has been properly informed by considering the higher

level plan order and assessing whether its many requirements were explicitly or implicitly accounted for in the timber supply analysis.

Operational plans

Licensees in the TSA periodically prepare forest development plans that present a timber harvesting and forest development strategy for the upcoming five-year period. District staff advise me that some licensees are having significant difficulty in identifying sufficient area for harvest on their forest development plans, while respecting all the various resource values and targets within their operating areas. The licencees have expressed concern about their chart areas, especially within shared landscape units and with respect to old-growth forest requirements.

I understand that a spatial analysis project is underway in cooperation with the licensees and the Ministry of Water, Land and Air Protection to assist in identifying constraints and opportunities for harvest while still maintaining critical environmental values. I support this approach. However, at this time it is not clear what additional constraints, if any, are restricting timber supply beyond those discussed in this determination.

Operationally, staff also note that the annual average harvest rate in the Kootenay Lake TSA has consistently been less than the current AAC, which in part is likely linked to the above discussion regarding difficulties administering chart areas.

While I am not making any specific adjustment in this determination with respect to operating areas, I do note that the district manager intends to continue to review the distribution of operating areas to ensure that there is reasonable equity between licensees with respect to having sufficient available area to support their ongoing operations.

Harvest sequencing

In the base case forecast, it was assumed that harvest priorities are placed on the random harvest of those stands which are older than the minimum harvestable age. For the purposes of modelling, this is expressed through the use of a *random* harvest rule.

Generally, licensees strive to first target the older, higher volume stands; however, this is not always possible due to operational constraints, forest health concerns or considerations for non-timber resources. Hence, once stands are above the minimum harvestable age, they are indeed harvested based on a selection of *random* ages.

Two sensitivity analyses were conducted: oldest first, and relative oldest first harvest rule. While neither had an impact on the base case forecast for 5 decades, the oldest first rule resulted in a higher long-term harvest level of 665 000 cubic metres per year. The relative oldest first rule resulted in an even higher long-term harvest level of 696 000 cubic metres per year. Clearly, there is potential to increase the long-term timber supply if harvesting the oldest stands first could be achieved operationally. I believe that the random harvest rule was an appropriate choice, given the actual practice in the TSA. I accept that a certain amount of "oldest first" is happening operationally, but I am also aware that licensees are forced, in many cases, to harvest closer to the minimum harvestable age. I note that the ages of stands selected for harvesting is an opportunity to increase future timber supply, but I do not feel it necessary to adjust the base case assumptions at this time.

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

Alternative rates of harvest

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large volumes of older forests often permits harvesting above long-term levels without jeopardizing the sustainability of future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and mid-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain healthy forests and future harvest stability.

In the analysis for the Kootenay Lake TSA, alternative rates of harvest were evaluated in addition to the base case harvest forecast. One option, in which a non-declining harvest forecast was tested, illustrated that an initial harvest level that could be maintained over the entire planning horizon was 605 000 cubic metres per year, or 14 percent lower than the current harvest level.

Another alternative tested the feasibility of maintaining the current AAC for as long as possible without causing timber supply shortages in the future. The results indicate that it is possible to maintain the current AAC for six decades before declining to the base case long-term harvest level of 605 000 cubic metres per year. However, in this forecast, there is a small drop in the mid-term timber supply in the 10th decade, after which it follows the same projection as in the base case. Because there is ample mature growing stock at the beginning of the planning horizon, it would be possible to project a higher harvest level, however it would not be possible to maintain a higher level for more than a few decades.

As mentioned earlier in this document under Timber Supply Analysis for the Kootenay Lake TSA, I have reviewed the alternative harvest forecasts provided, and I am satisfied that the harvest flow selected for the base case, provides the most suitable forecast of timber supply, and provides a suitable basis from which to evaluate the assumptions applied in the analysis.

Community implications

I have reviewed the information presented in the socio-economic analysis for the Kootenay Lake TSA, and I am aware of the implications to communities of changes in the harvest levels for the TSA.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

Timber processing facilities

I have reviewed the information regarding timber processing facilities, and I am aware of the reliance of timber processing facilities on the volume harvested in the Kootenay Lake TSA.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,

Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996, (attached as Appendix 4). The letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the contents of the letter and memorandum in my determination of an AAC for the Kootenay Lake TSA.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. Many public responses were received to the information report and data package, and to the timber supply and socio-economic analyses. The summary of public input is reproduced in full as Appendix 5.

The KBLUP, the intent of which forms current practice in the Kootenay Lake TSA and has been accounted for in this determination, was approved after years of public dialogue and negotiation. The Kootenay-Boundary Higher Level Plan Order was recently established by government and it provides further clarification for some objectives as they continue to be implemented.

Local objectives have been an important consideration in my determination of an AAC for the Kootenay Lake TSA. I have considered all public input received on the timber supply review, and where appropriate I have responded briefly to this input in this rationale.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Unsalvaged losses

District staff have advised me that recent losses due to windthrow and insects, particularly Douglas-fir bark beetle, have increased significantly – from 5693 cubic metres per year as reported in the analysis to a current estimate of 9871 cubic metres per year. Given the recent increase in Douglas-fir beetle activity within the Kootenay Lake TSA, it seems reasonable to reflect this new information in the unsalvaged loss estimate.

Several public submissions questioned the reduced unsalvaged losses, relative to TSR 1, and pointed out that factors such as climate change, insect activity, and armillaria root disease all have the potential to greatly increase these losses. However, district staff submit that the higher estimate of 9871 cubic metres per year reflects the most current information available.

I have reviewed the estimates applied in the base case and the new information that has come forward regarding additional losses attributed to the Douglas-fir bark beetle. I accept that unsalvaged losses were underestimated in the base case forecast by about 4178 cubic metres per year, or 0.6 percent of initial harvest level (short and long term). I have accounted for this underestimation as discussed below under, 'Reasons for decision'.

Reasons for decision

In reaching my AAC determination for the Kootenay Lake TSA, I have considered all of the factors presented to me, and I have reasoned as follows.

The base case forecast projected that an initial harvest level of 691 000 cubic metres per year could be maintained for five decades before declining to a long-term harvest level of 605 000 cubic metres per year in the seventh decade. The initial level was based on the current AAC of 700 000 cubic metres, less 9000 cubic metres per year for woodlots issued since the last determination.

Section 8 of the *Forest Act* requires me to consider a number of factors in the determination of an AAC for a timber supply area. In determining an AAC, my considerations identify factors which, when considered separately, indicate that the timber supply may actually be greater or less than that projected in the base case forecast. Some factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by introducing an element of risk or uncertainty to the decision, but cannot be reliably quantified at the time of the determination.

Following is my consideration of those factors for which I consider it necessary to take into account implications to the timber supply as projected in the base case forecast. I have not included those points (both upward and downward) which I judged to be insignificant in terms of timber supply impact.

Factors which indicate that the timber supply projected in the base case forecast may be underestimated, and to a degree that can be quantified to some extent are as follows:

1) *existing roads, trails and landings* – the level of existing roads, trails and landings was overestimated by approximately 0.2 percent, and therefore there is a slight upward pressure on the timber supply in the short to long term.
2) *woodlots* – approximately 1000 hectares of the timber harvesting land base were excluded from the timber supply for pending woodlot areas, which have not yet been issued. Including this area into the timber harvesting land base results in an approximate increase of 0.4 percent to the timber supply in the short to long term.

Factors which indicate that timber supply projected in the base case forecast may be underestimated, but to a degree that cannot be well quantified, are as follows:

1) *site productivity* – I acknowledge that the site productivity of second-growth forests is underestimated by site index measurements taken from existing old growth forests, although the magnitude of this underestimation is uncertain. The positive impacts on timber supply would be primarily in the mid to long term; sensitivity analysis suggests this could be as much as 11 percent.
2) *ungulate winter range* – I accept that the base case forecast included an ungulate winter range zone that is now about 15 percent smaller. This likely represents a very small upward pressure in the long term.

In addition to those factors which indicate that timber supply may be underestimated in the base case forecast, I have also identified a number of factors which indicate that the base case has likely overestimated timber supply, as follows:

1) *unmerchantable forest types* – recent survey information indicates that more forest types should be consider as unmerchantable than assumed in the base case forecast—approximately 1 percent for lodgepole pine, and a range of uncertainty between 0 to 2.5 percent for older hemlock. This could affect timber supply forecasts in the short and long term.
2) *Harrop-Procter Community Forest* – this is an area-based licence, and as required by the *Forest Act* should not contribute to the timber supply for the TSA. It covers about 5127 hectares of the timber harvesting land base, with an estimated contribution of 9700 cubic metres per year.
3) *timber licence and agreement lands* – I accept that the timber harvesting land base has been overestimated by 0.13 percent in the short term as a result of the analysis assumption that 325 hectares of mature forest will revert to the TSA prior to harvest;

4) *silvicultural systems* – after harvesting, some residual trees are being left on site, apart from wildlife tree patches. This residual volume results in a downward pressure on timber supply of approximately 1.5 percent and could affect the projected short- and long-term harvest levels.
5) *class U & V terrain in community watersheds* – I accept the district staff's recommendation that class U and V terrain in community watersheds should not contribute to the timber supply. This does not represent a large amount of area (0.4 percent), but could affect the timber harvesting land base in the short and long term.
6) *identified wildlife management strategy* – the implementation of the IWMS, including identification of wildlife habitat areas and attainment of general wildlife measures, results in an impact to the timber harvesting land base of up to 1 percent in the short and long term.
7) *riparian habitat* – I accept that riparian management areas were underestimated by approximately 683 hectares in the base case. This represents about 0.3 percent of the timber harvesting land base in the short and long term.
8) *unsalvaged losses* – a recent review of insect damage shows that the unsalvaged losses applied in the analysis were underestimated by 4178 cubic metres per year, or 0.6 percent of initial base case forecast. This could affect the timber supply forecasts in the short and long term.

Factors which indicate that timber supply projected in the base case forecast may be overestimated, but to a degree that cannot be well quantified, are as follows:

1) *armillaria root disease* – the impact of armillaria root disease on timber supply has likely been underestimated, particularly with regard to growth projections of Douglas-fir. This potentially represents a downward pressure of up to 3.6 percent, which could affect timber supply projections in the mid and long term.
2) *ageing of the non-contributing productive forest* – no allowances were applied in the analysis to account for future disturbances on the non-contributing productive forest, hence these forests aged indefinitely. Historical natural disturbance patterns indicate that some disturbance, such as wildfires, are likely to affect the age class structure. As discussed below, I considered an approach that accounts for some rate of disturbance.

In summary of the above factors, the upward pressures on timber supply are less than 1 percent in the short term, and possibly up to 12 percent in the long term. On the other hand, the downward pressures on timber supply are within the range of about 6 to 9 percent in the short term, and up to 12 percent in the long term.

While I am aware of the timber supply implications of each of these factors on its own merits, I acknowledge the difficulties associated with assessing their cumulative effect on the base case forecast. As a result, I requested that additional analysis be completed to provide me with an assessment of the interaction of the major factors — a 5-percent reduction to the current timber harvesting land base, and the assumption that non-contributing forests will be influenced by natural disturbance over time. The resulting harvest forecast showed that the initial harvest level could still be maintained for the next

four decades, however the long-term harvest level would decline to 515 000 cubic metres per year. This analysis illustrates that short-term timber supply in the Kootenay Lake TSA is stable despite the additional factors acting to constrain timber supply.

With respect to the uncertainty identified regarding harvesting in the inoperable area, reduced stocking levels in NSR areas, small delays in prompt regeneration and reported bear damage in plantations, I am confident that these uncertainties do not pose a significant risk to the projected timber supply in the short term.

Given the information documented to this point, I have reasoned as follows. First, I am focusing my consideration on the combined interactions of factors affecting the short term. I am satisfied that the long term factors which serve to either increase or decrease timber supply offset one another.

Secondly, acknowledging the potential uncertainty arising from the contribution of older hemlock stands (0 to 2.5 percent), the combined sum of the downward factors affecting the short term is a net downward pressure of between about 4.4 and 6.4 percent. This is after accounting for the upward short-term pressure of 0.6 percent and also after accounting for my intention to reduce the AAC by about 1.4 percent (9700 cubic metres per year) to account for the recently issued Harrop Proctor Community Forest tenure.

Therefore, turning to the findings of the additional analysis that was undertaken at my request, I note that short-term timber supply is quite stable even after a 5-percent land base reduction and accounting for the influence that the ageing of the non-contributing forested land base on the attainment of the landscape unit objectives. In summary, I consider the additional analysis to be a reasonable approximation of the findings of my review, and note that it indicates there is sufficient stability in the short term projections to absorb any further small uncertainties that might exist with respect to constraints on the short-term timber supply.

I am mindful that in the last determination, the AAC was reduced by about 22 percent. At that time, the actual harvest levels were dramatically below the AAC. More recently, the annual harvest levels have been about 10 percent less than the current AAC, which may in part be due to administration of chart areas. I understand that a spatial analysis project is underway that may help to identify opportunities for harvest, while maintaining critical environmental values.

It is highly probable that site productivity has been underestimated in the Kootenay Lake TSA— as it is elsewhere in the province—on sites currently occupied by older forests. If site productivity has been underestimated to the degree indicated by provincial studies, then the long-term timber supply may be higher. However, it is not possible to determine an appropriate adjustment for this TSA without localized data. In the short term, for this determination I am confident that the timber supply is not dependent on adjusting site productivity at this time.

There is one remaining concern about current operations in the Kootenay Lake TSA. I am mindful of the sensitivity of harvesting in some watersheds, particularly if harvesting is expected to be conducted at a level which reflects the productive capacity of the area. Public land-use processes (the KBLUP and the Kootenay-Boundary Higher Level Plan

Order) have occurred in which much public opinion and input has been considered. The recommendations arising from these processes guide operations in the TSA, and the direction includes management for timber values in the entire TSA, including these watersheds, in conjunction with other values.

I am satisfied from review of the information that the analysis assumptions, combined with any adjustments I make in this determination as described in the reasoning above and as incorporated into the additional analysis discussed above, reflect the intention of the Kootenay-Boundary Higher Level Plan Order.

In keeping with ministerial direction to minimize socio-economic impacts on communities and the forest industry wherever possible, I believe that an appropriate harvest level for the Kootenay Lake TSA at this time is 681 300 cubic metres per year.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a harvest level that accommodates objectives for all forest resources during the next five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the Kootenay Lake TSA by establishing an AAC of 681 300 cubic metres, effective January 1, 2002. This AAC excludes 9000 cubic metres issued to woodlot licences since the previous determination, and 9700 cubic metres from the Harrop-Procter Community Forest area, and is otherwise unchanged from the current AAC.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects is dependent on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Kootenay Lake TSA. I recommend that district staff:

- Complete a thorough review of the current operability lines, which could include an assessment of various categories of operability (i.e. based on conventional versus aerial harvesting systems).
- Review the definition of unmerchantable forest types to ensure that all unmerchantable stands are captured.
- Conduct field examinations to provide more accurate estimates of the extent of existing roads, trails and landings.
- Evaluate existing and projected impacts of various forest health agents, in particular, develop possible mitigative strategies that might reduce potential impacts from armillaria root disease.

Larry Pedersen
Chief Forester

November 6, 2001

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silvicultural treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

   (a) encourage maximum productivity of the forest and range resources in British Columbia;

   (b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

   (c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

   (d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

   (e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

Appendix 5: Summary of Public Input

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: **The Crown's Economic And Social Objectives Regarding Visual Resources**

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis.*

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests

Kootenay Lake Timber Supply Area
Timber Supply Review

Summary of Public Input

BC Ministry of Forests
Kootenay Lake Forest District
RR1 S22 C27
1907 Ridgewood Road
Nelson, BC
V1L 5P4

November, 2001

This is a summary of the public input received on the Timber Supply Review in the Kootenay Lake Timber Supply Area. This summary does not assess the feasibility or validity of the input or whether it relates to the clearly defined mandate of the chief forester in the allowable annual cut determination.

Kootenay Lake Timber Supply Area

Background

As part of the review of timber supply in the Kootenay Lake Timber Supply Area (TSA), two opportunities were provided for public input. The first followed release of the Kootenay Lake TSA *Data Package* and *Information Report* in May 1999. The *Information Report* was a non-technical summary of the draft data and management assumptions that were to be applied in reviewing the timber supply for the Kootenay Lake TSA. A 30-day review period, ending June 7, 1999, was provided for the public to comment on these documents. This date was extended to July 16, 1999.

On March 21, 2001, the British Columbia Forest Service released the *2001 Kootenay Lake Timber Supply Area Analysis Report* and *Public Discussion Paper*. The public was encouraged to review and comment on the accuracy of the information in these documents and to provide additional information during the 45-day review period that ended May 22, 2001.

This report summarizes the input received during both public review periods. This information was provided to the chief forester for his consideration when he reviewed the allowable annual cut (AAC) for the Kootenay Lake TSA. The first section of this summary outlines the public review process implemented by the Forest Service, and describes the types of public input received. The second section summarizes the public input in sufficient detail to indicate the range of input received. The original submissions (with personal identifiers removed in accordance with the *Freedom of Information and Protection of Privacy Act*) can be reviewed at the Kootenay Lake Forest District office.

Public Review Process and Response

Kootenay Lake District staff actively solicited public input on the Timber Supply Review in the Kootenay Lake TSA through the following actions:

- 82 copies of the *Information Report, Data Package, Public Discussion Paper* and *Analysis Report* were mailed to stakeholders in the TSA, such as First Nations, forest licensees, water users, environmental groups and local governments. In a cover letter, meetings or presentations were offered on request.
- the *Data Package* and *Analysis Report* were available at the district office north of Nelson and the regional office in Nelson; approximately 40 were picked up.
- newspaper advertisements were placed, advising of the availability of all documents for review by the public.
- copies of all the documents were made available to the local media, along with contact names for follow-up interviews. One radio interview was conducted.
- a presentation on the *Analysis Report* was made to the Creston Public Advisory Committee (a Round Table forum) on April 24, 2001.

The Kootenay Lake Forest District received eight written submissions on the *Data Package* and 12 submissions on the *Analysis Report* (see Appendix 1).

Public Input

In this section, public input on the information presented in the Timber Supply Review documents for the Kootenay Lake TSA is summarized under the following headings:

- Data Package (and Information Report)
- Timber Supply Area Analysis Report (and Public Discussion Paper)
- Other comments

Data Package

Operable Land Base

Two forest industry submissions say that eight percent of current operations are above the operability line and this must be incorporated as current practice in the base case. Another submission expresses agreement with not changing operability lines, saying that the last couple of years of market ups- and-downs indicate this factor is subject to wide fluctuations.

The Interior Lumber Manufacturers' Association (ILMA) asks if industry has agreed to the areas excluded from the land base as uneconomic and whether a partition was considered. Two other submissions say a portion of Lake Creek should be excluded due to high development costs, the rejection of the forest development plan in that area, and the potential impacts of harvesting and road-building.

Environmentally Sensitive Areas

An individual submission says replacing Environmentally Sensitive Area (ESA) mapping for sensitive soils with new terrain mapping is a positive step, while the Queens Bay Residents Association (Queens Bay Association) says existing terrain mapping is highly inaccurate, based on recent experience of mass wasting events in areas mapped as stable. Both submissions recommend increasing the netdowns for sensitive soils, particularly in domestic and high value fisheries watersheds.

The Kootenay Lake Forestry Association (Forestry Association) agrees with the use of terrain mapping information and recommends a reduction to certain sensitive soil netdowns.

The ILMA questions why a land base reduction is applied for ESAs. This should be handled as a volume reduction, consistent with other TSAs, according to this submission.

Low Productivity Types

The Forestry Association expresses concern that some sites may be dropped because of inaccurate site index estimations in old-growth stands.

An individual submission says forest cover typing at high elevations is not very reliable and recommends removing anything labeled alpine with a forest type as well as those simply labeled alpine, or the use of biogeoclimatic zonation and the removal of all stands mapped as parkland or alpine tundra.

Problem Forest Types

The Forestry Association says that just because older white pine is rare is no reason to eliminate its availability with a 100 percent reduction.

Two submissions question the 50 percent reduction for aspen-leading stands. One says these stands should be 100 percent excluded as they have insignificant coniferous components.

Roads, Trails & Landings

The Queens Bay Association says existing rights-of-way should be counted as permanently unstocked and be included in early seral calculations. Two submissions question the assumption of no detrimental disturbance from future trails, based on 100 percent rehabilitation, noting other disturbance from harvesting and treatments such as stumping will still occur.

Two forest industry submissions say the average right-of-way width of 18 metres overestimates the impact of roads, citing a study in Golden that indicated an average width of 11 metres. The Forestry Association says widths should vary depending on road type and provides recommendations and an alternate formula for calculating road widths. The association also notes the *Data Package* has no information on future reductions, and this is a significant shortcoming.

Forest Inventory

The ILMA asks how the results of the inventory audit will be incorporated in the analysis.

Minimum Harvestable Age

The Forestry Association says Table 15 (minimum harvestable age criteria) is confusing, but suggests that a maximum slope cut-off of 40 percent is better than 35 percent. The ILMA says slope criteria should not have an impact on minimum harvestable age and notes the lack of data to comment on.

Managed Stand Volumes

Four submissions comment on the operational adjustment factor (OAF2) used to account for volume losses that increase with age (e.g., due to disease). Two submissions say the OAF2 of 15 percent is too low and should be increased to 20-25 percent, citing the following reasons:

- recent pathologist's studies indicate a 20 percent loss to root rot is more reasonable.
- climate change will potentially increase the incidence of some diseases and pests.

Two forest industry submissions say the use of a 15 percent OAF2 is unacceptable without clear empirical evidence, and this factor should be reduced to five or seven percent. They also ask how genetic gains will be modeled and how results of the Old Growth Site Index (OGSI) study will be used.

Not Satisfactorily Restocked Areas

An individual submission says the assumptions about restocking Not Satisfactorily Restocked (NSR) areas are overly optimistic given recent budget cuts, especially to Forest Renewal B.C., and recommends they be reduced by half. This individual also says it seems unrealistic to assume the future use of herbicides.

The Queens Bay Association says all backlog NSR should be removed from the timber harvesting land base (THLB) until successfully restocked.

The Forestry Association disagrees with Table 21b of the *Data Package*, saying all current operable NSR will be reforested within one to three years, and then the rest will be reforested.

Forest Cover Constraints

The Forestry Association questions why the Integrated Resource Management (IRM) zone is limited to a maximum of 25 percent of the area under two metres tall at any one time. Given the importance of the IRM zone for fibre supply, this should be increased to at least 35 percent, according to the association.

Visually Sensitive Areas

The Forestry Association provides recommendations on disturbance levels in visually sensitive areas, noting that current cut block design and the use of portrait cutting facilitates a higher level of disturbance. An individual and the Queens Bay Association say the inventory overestimates the availability of visually sensitive timber, because the 1998 update was not subject to adequate public review and does not reflect standards of public acceptance and the needs of a growing tourism sector.

Kootenay Lake Timber Supply Area

Watersheds

Two submissions say that based on recent research, a green-up height of nine metres in watersheds is insufficient. The Forestry Association says stands contribute to hydrologic green-up in progressive percentages, not just at a nine-metre height. The association says a sliding scale should be used or the nine metres prorated to reflect the contribution of shorter stands.

An individual submission says the cover constraints for community watersheds should also be applied to high value fisheries watersheds. The Forestry Association says that not every watershed is sensitive and the allowable disturbance should be 23 to 25 percent, based on licensees' estimation of current practice. The association also questions how private land is dealt with.

The ILMA says watershed constraints result from the Kootenay-Boundary Land-Use Plan (KBLUP) Implementation Strategy and should therefore be modeled as sensitivity analyses only.

Riparian Management

Three forest industry submissions say the netdowns for riparian reserve and management zones are not consistent with the Forest Practices Code. Suggested changes are provided by the Forestry Association.

Two submissions say the reserve estimates for smaller streams will be severely underestimated due to the scale of the BC Watershed Atlas. A lack of information to identify fish-bearing streams is also noted.

An individual submission says the 1998 Riparian Management Audit identified that riparian guidelines may have a larger impact than outlined in the *Data Package*, due to licensees locating cutblocks to avoid implementing actual management zones. This would have the effect of reducing apparent timber availability (due to isolating some stands) and should be examined in a sensitivity analysis, according to this submission.

Wildlife

Two forest industry submissions say reductions to the THLB for Wildlife Habitat Areas should only occur when these areas are established in law.

The Forestry Association says a one percent reduction for grizzly bears is totally inappropriate as the KLBUP task force confirmed security cover would not be a separate deduction. An individual says land base deductions should not be limited to grizzly bears and an additional one or two percent is needed for management of other species.

The Forestry Association says work is ongoing on the mapping of caribou priority habitat and requests a sensitivity analysis to assess the impact of the revised mapping. The ILMA says caribou habitat must be modeled as a sensitivity only.

The Forestry Association questions the use of the current ungulate winter range map, which they say grossly overestimates the area. They say industry has submitted revised mapping and it should be used in the base case or at least in a sensitivity analysis. The association says the ministry's approach to ungulate range guarantees cover but not food supply.

Stand Level Biodiversity

An individual submission says the Wildlife Tree Patch (WTP) requirements are too low, noting that Table 20(b) of the *Biodiversity Handbook* should be used to establish these requirements since biodiversity emphasis objectives (BEOs) are not yet established.

The ILMA asks for confirmation that the modeling impacts of WTPs are volume only (not land base). The ILMA and the Forestry Association ask why the chief forester's direction of a total impact of 1.8 percent for WTPs is not being followed.

Landscape Level Biodiversity

An individual submission says the cover requirements for old and mature should be increased for Interior Cedar-Hemlock units, referring to Appendix 4 of the *Biodiversity Guidebook* that says where 12 percent protected does not exist (as in the ICH), the requirement can be adjusted for the actual percentage protected.

This individual, again referring to Appendix 4, says old and mature forests in protected areas were already counted once in setting cover requirements and should not be allowed to contribute a second time during the analysis.

The Queens Bay Association says the analysis should use only the actual old forest present, not numbers that assume 12 percent protected in each biogeoclimatic unit. The association recommends a sensitivity analysis on immediate full implementation of the old seral requirement for low BEO areas, saying the three-rotation delay is an unreasonably long time to allow for compliance and represents an unacceptable threat to biodiversity.

The ILMA says the analysis should not model KBLUP requirements, such as old seral patches, except in sensitivity analyses. The association expresses concern about the placement and guidelines for all resource emphasis areas. The Forestry Association expresses similar concerns and says there's a significant legal question as to whether landscape unit boundaries and BEOs can be legalized without objectives being set. Until this is resolved the Forestry Association says BEOs should be treated as a sensitivity.

Unsalvaged Losses

Two submissions say climate change may radically impact unsalvaged losses and these estimates should be increased or at least examined in a sensitivity analysis.

The Forestry Association says the estimates appear realistic but the distribution could be reconfigured. The ILMA requests the inputs to these estimates be reviewed by licensees.

Kootenay-Boundary Land-Use Plan

The ILMA says the analysis should focus on Code requirements only, given the current state of confusion over the status of the KBLUP which currently has no standing in law. The Forestry Association says KBLUP is government policy but the Code takes precedence, as it is law.

Harvest Sequencing

Three submissions express agreement with the use of a random harvest queue in the analysis, while the ILMA says the 'oldest first' rule must be used to be consistent with the rest of the province.

Socio-Economic Factors

An individual submission notes that employment is already diverse in this TSA, and the area is a destination for tourism and also for people seeking a high quality of life. Local businesses are already demonstrating initiative in coping with changes in the forest industry (e.g., log sort yards, value-added mills), according to this submission.

Timber Supply Area Analysis Report

Land Base Factors

Tembec Industries Ltd. says licensee data indicates that more than eight percent of the harvest currently occurs in the inoperable. The company says the need for a more dispersed cut combined with landscape design, enhanced terrain assessments, increased total resource planning and proven licensee performance will result in a much higher percentage of harvesting in areas currently excluded.

The Forestry Association says a study conducted by major licensees of all blocks harvested between 1994 and 1998 demonstrated

that 5.3 percent of the cut came from above the operability line, and notes that current forest development plans indicate an increasing trend. The association says that since only 21 percent of the entire land base in this TSA is considered available for harvest, one can't help but think the THLB may be underestimated and provides an approach to more accurately estimate it.

The Valhalla Society says there would be increased pressure to lower the operability line if licensees had to pay the actual costs of logging on steep slopes (e.g., remediation costs for landslide damage).

Two submissions say major portions of Lake Creek should be excluded from the THLB, given environmental risks and costs associated with harvesting there. Tembec says the licensee in East Creek indicates that development opportunities do in fact exist there. The Erickson Water Users Society (Erickson Water Users) says the size of the THLB needs to be reduced immediately by removing all domestic and community watersheds and areas of old-growth forest.

Two submissions say that given uncertainty about export markets, the implications of eco-certification and pressures from other forest users it would be prudent to assume the base case is overly optimistic in estimating the size of the THLB. They say heli-logging above the operability line depends on extremely high markets and it's unwise to include these areas in the base case.

An individual submission says the Midge Creek drainage should be available for harvesting.

Environmentally Sensitive Areas

The Kootenay Centre for Forestry Alternatives (KCFA) says the estimates of area unavailable for harvesting in areas mapped as unstable (class V) or potentially unstable (class IV) may be low. Based on a review of terrain maps, KCFA says it appears mappers tend to classify areas as class V only if they are actively sliding, indicating the chance of harvesting is very slim and an assumption of 100 percent unavailable would be reasonable. The reduction in class IV areas would be better modelled at 40 percent given uncertainty around the number and the presence of other resource values, according to KCFA.

The KLFA questions the 30 percent netdown used for class IV/potentially unstable areas. While they do not have data to counter the netdown, the association believes future assessments will support their position.

Roads, Trails and Landings (RTLs)

Tembec agrees that 7.5 percent may overestimate the area of existing trails and landings. Tembec and the KLFA provide information on actual road widths. The Queens Bay Association notes the lack of justification for the 36 percent decrease in RTL deductions from the previous Timber Supply Review.

Two submissions say the new methodology does not account for unmapped roads, or trails and landings. They say the 11 percent deduction used in the previous Timber Supply Review is likely reasonable, plus three to four percent for landings, trails and other unmapped disturbances. The two submissions say future RTLs should also remain at 11 percent as newer roads climb into steeper terrain and require wider right-of-ways.

Volume Estimates in Existing Stands

The KLFA says that until more information is gathered to justify changes to estimates of existing stand yields, they agree with the base case estimates.

Managed Stand Volumes

Tembec notes the OGSI study resulted in a consistent trend across the province that site productivity is underestimated, and says conservative increases could be rationalized in the absence of hard data. The company also says genetic gains are underestimated in the analysis.

The KLFA says the yield from managed stands is underestimated, and yield curves need to be adjusted to reflect genetically improved stock, site index adjustments and other factors. The association notes that experience in the Arrow TSA and TFL 14 with PEM (predictive ecosystem mapping) showed gains in site index, and a similar result is anticipated in Kootenay Lake TSA.

KCFA says potential gains from genetic improvement and OGSI are highly speculative with little or no local data.

Two submissions say the use of the TIPSY model for projecting growth in managed stands is highly speculative and recommend a 10 percent decrease in yields.

With regard to the operational adjustment factor (OAF2) used in the analysis, three submissions say the change from 15 percent to seven percent is not supported by information from local Ministry of Forests pathology experts. They say losses from Armillaria alone may well exceed seven percent and clearcutting is a known factor in the spread of the disease.

Tembec also questions the arbitrary use of seven percent for OAF2, saying it should remain at the provincial standard of five percent. The Forestry Association says the increase from the provincial standard to seven percent is reasonable, but more work is needed to accurately quantify losses due to Armillaria.

Regeneration Factors

Three submissions question the assumption of regeneration delays of two and three years being current practice. They say this implies every block must be planted or naturally regenerated immediately with zero failures, and that delays of three to six years is more reasonable. Even if the shorter delay were true, these submissions say it has important biodiversity implications for species that depend on early seral habitats.

KCFA says the schedule for achieving full stocking of NSR areas may be overly optimistic given uncertainty about Forest Renewal funding and about the use of herbicides in the Kootenay Lake area.

Silvicultural Systems

Two submissions note that no partial cutting was modelled although this is a requirement for meeting Higher Level Plan caribou objectives, and could also potentially be used to increase timber access in watersheds or visual management areas.

Forest Cover Requirements

The Valhalla Society says the analysis allows too high a percentage of the THLB to be below green-up age and this must be reduced. The society and KCFA express the opinion that green-up ages have been underestimated. Tembec says the reduction in green-up ages can be rationalized based on OGSI results or genetic gains, while the Forestry Association points to licensee experience in the Arrow TSA where the time to achieve the green-up height was overestimated by 17 to 30 percent.

Tembec and the Forestry Association say the level of disturbance (equivalent clearcut area, or ECA) is not currently viewed as a binding constraint on the land base but rather an indicator of planning acceptability. The two submissions say a suitable rationale will in most cases permit harvesting above the ECA threshold.

The Erickson Water Users' submission says a two-metre green-up height is ludicrous in terms of water quality.

Visually Sensitive Areas

Tembec says a relaxation in visual quality objective limits is not unrealistic given the increasing use of visual design packages and because visual absorption capacity is higher in many visually sensitive areas as harvesting is already present. The Forestry Association says the current emphasis on good cutblock design, with the strategic placement of retention areas

and selective systems, demonstrates that the disturbance limits used in the analysis can be and are being exceeded.

Three submissions say the current objectives are not sufficient, noting that public expectations and the increasing importance of tourism will increase constraints as has already occurred in a number of local planning processes.

Watersheds

The Valhalla Society says protection of water quality, quantity and timing should be the primary objective in all consumptive use watersheds. The society says a reduction in permissible disturbance and an increase in the green-up age are necessary, and important and sensitive watersheds must be removed from the THLB.

The Queens Bay Association says while some harvesting has occurred in previously deferred watersheds, the level of harvest suggested by the watershed guidelines has not been accomplished, and reductions in harvest levels should be accounted for in the analysis.

KCFA says the constraints modeled appear to be consistent with current practice, but given increasing awareness about water one might assume constraints may increase, creating a downward pressure on timber supply. KCFA notes that no consideration was given to management in high value fisheries watersheds, which should also be subject to cover constraints.

Tembec says there's much confusion about how to treat streams in domestic watersheds. The company suggests the best management practices in the *Riparian Management Guidebook* be used as a surrogate to model impacts on timber supply, but not across the land base as this would falsely create a downward pressure on timber supply.

The Forestry Association is of the opinion that watershed ECAs are too conservative, given the generally accepted position that ECAs are only one of a number of indices for watershed condition. The association expresses support for the management principles for domestic watersheds outlined in the *Strategies for Kootenay-Boundary Land Use Plan*, dated May 14, 2001.

Riparian Management

Tembec says the application of best management practices from the *Riparian Management Guidebook* to define riparian reserve zones is the exception rather than the rule, and it's perhaps more accurate to reduce the impact on timber supply by releasing some of the constraints generated by this modeling approach.

Three submissions says the base case underestimates the impacts of riparian management because a large percentage of small streams are not mapped, there's a lack of information on fish-bearing streams, and because what is modeled is the minimum and public pressure will continue to increase constraints.

An individual submission says it's now widely accepted that the requirements of the *Riparian Guidebook* are inadequate to protect riparian functions and they are also below the standards of virtually all other jurisdictions (references provided). Given the approach of forest certification in addition to emerging public expectations, it is unreasonable to expect current management will be sufficient in the future.

Caribou and Other Wildlife

Tembec and the Forestry Association say the current approach to caribou management is viewed as conservative by many of the biologists involved and note the ongoing review of caribou habitat (and ungulate winter range). These submissions say many areas presently encumbered by caribou habitat management will ultimately be available for harvesting, as understanding of habitat requirements improves and appropriate areas are set aside. The Forestry Association also says spatially modeling smaller units encumbered by habitat management

policies generally shows increased harvest levels, due to managing to maximum annual growth.

Two submissions say the Higher Level Plan caribou guidelines for reserves were adequately modeled but the partial cutting component was ignored. It would have been more reasonable to make assumptions similar to the partial cutting management zones in riparian areas, says KCFA, and provides an example. The Valhalla Society says caribou herds are in serious decline and habitat objectives need to be increased immediately and further harvesting suspended until a viable herd can be established and maintained.

KCFA says the base case does not adequately consider the impacts of measures required to meet the Identified Wildlife provisions of the Forest Practices Code, as the *Analysis Report* indicates the full one percent cap on timber supply impacts will be consumed just protecting grizzly habitat. KCFA says the one percent cap is likely inadequate and five percent might be more reasonable, noting that the management of red- and blue-listed species was also not sufficiently considered.

Stand Level Biodiversity

Tembec estimates that about 20 percent of established WTPs will experience a salvage operation, and therefore the 2.2 percent land base reduction could be reduced to 1.8 percent.

KCFA says the 2.2 percent reduction should increase to about five percent, and provides a rationale based on the *Biodiversity Guidebook*, professional knowledge and the fact that coarse woody debris needs were not considered.

Landscape Level Biodiversity

The Valhalla Society says more old seral requirements need to be met on the THLB because the use of small islands of old growth in protected and inoperable areas does not represent the habitat available prior to the past 40 years of clearcutting. The society says many landscape units are in a deficit for old growth and this should be eliminated by reserving the next closest age classes to the deficit types, not by targeting clearcuts or juvenile forests and labeling them old growth recruitment areas.

The Forestry Association maintain that specifying that biodiversity objectives be met only from the THLB is inflexible and not consistent with current practices. From an ecological perspective, the licensees say, there is no operability line.

Tembec and the Forestry Association say achieving old seral targets now would be a violation of the Higher Level Plan, which allows three rotations for full implementation. The Forestry Association also makes a case for decreasing the definition of old seral by 40 years, saying that old-growth attributes still exist within slightly younger stands.

Tembec says that although confusion exists around the concept of connectivity corridors, there is regional recognition that the constrained land base currently provides many of the purported benefits. The Forestry Association says that not including connectivity corridors in the analysis may have a positive effect on timber supply as these corridors are generally very large in this TSA.

Four submissions comment on the base case assumption that excluded forests continue to age without disturbance. Tembec and the Forestry Association say enhancing fire suppression activities could easily alleviate a downward pressure on timber supply by maintaining stands outside the THLB. The Queens Bay Association and KCFA say the assumption of continuous aging is incorrect and the static age class distribution (Figure 18) might be closer to present management. The groups note the present approach is to not fight fires outside the THLB (e.g., Fry Canyon) and that windthrow, disease and insects also affect stands.

KCFA says the lack of spatially modeling Old Growth Management Areas (OGMAs) fails to account for another downward pressure on timber supply.

Unsalvaged Losses

Three submissions say the greater than 50 percent decrease in estimated losses from the previous Timber Supply Review is not justified. The Queens Bay Association says current experience shows a substantial increase in losses to windthrow and insect attack arising in part from the effect of Armillaria in mature stands, coupled with recent drought conditions. The association and KCFA say climate change also creates an expectation of increasing losses.

Community Forest Licences

Tembec says the current AAC for the Harrop-Procter Community Forest could be increased three to four times.

An individual submission says the Arrow Creek watershed (part of the Creston community forest licence) should not be logged as the ECA exceeds the maximum recommended for community watersheds and instead suggests a study to evaluate the feasibility of declaring the watershed a wildlife sanctuary.

The Erickson Water Users say it is neither economically nor ecologically feasible to harvest the Arrow Creek watershed, and express concern with the way in which the community forest was established and the debt the Creston Valley Forest Corporation has accumulated.

Harvest Sequence

KCFA says the use of a 'random' harvest queuing rule in the timber supply analysis is closer to current practice than 'oldest first.' This opinion is based on reviews of forest development plans, the overlapping constraints on much of the land base, pest management priorities and the complexity of numerous operating areas in this TSA.

Tembec and the Forestry Association are of the opinion that 'relative oldest first' would best capture operational planning, which tends to occur in the oldest of those stands available for harvest.

Implications of Alternative Rates of Harvest

The Queens Bay Association notes that direct forestry employment is only four percent of the labour force in this TSA, and non-forestry sectors depend on 'quality of life' and other values associated with maintaining a natural environment.

An individual submission challenges the pervasive bias in the analysis that higher rates of cut are better for the local economy and local communities, noting that the rate of cut affects:

- quality of life and hence people's desire to live, invest and work in the area;
- the provision of ecosystem services by forests; and,
- economic opportunities for non-timber-related businesses and for value-added operations (as high quality old growth will be liquidated).

This submission identifies a variety of factors, including legislation, policies and objectives, which imply a long-term perspective of forest management not limited to the benefits of timber production. Other factors identified in this submission indicate there would be social and economic advantages, in line with the Crown's social and economic objectives, to reducing the rate of logging.

KCFA and an individual submission say that maintaining the current AAC will pose a significant risk to environmental values (examples are provided) and increasing this risk is clearly one of the "short- and long-term implications to the province" that should be avoided. KCFA says an AAC reduction would also be consistent with direction letters about the

need to limit disruption to local economies, noting that according to the socio-economic analysis tourism is the most dynamic and expanding sector in this TSA.

Other Comments

Most submissions comment on factors or issues other than those specifically covered by Timber Supply Review documents. These comments are summarized in this section.

Timber Supply Review Process

Many submissions comment, some in great detail, about the process and/or methodology of the Timber Supply Review. These comments include:

- a concern that discussions with forest industry representatives occurred outside the prescribed review period and did not include other stakeholders.
- the base case is a reasonable assessment of forests and forest management in this TSA.
- the analysis was well-executed and includes modeling of most relevant factors.
- optimistic and largely speculative assumptions were used to establish the base case, demonstrating a strong and pervasive bias toward maximizing timber production.
- the analysis fails to address a number of key issues and is therefore an inadequate basis for the chief forester to use in making his determination.
- the chief forester's interpretation of "short- and long-term implications" is unduly restrictive.

Harvest Levels

Ten submissions comment on the harvest level to be determined by the chief forester.

Tembec and the Forestry Association identify a number of possible upward pressures on timber supply. These include:

- a recognition that ungulate winter range and caribou management zones have been refined and reduced in size since the *Analysis Report* was completed.
- a recognition that the constrained land base contributes to connectivity.
- a five percent increase in estimated volume yields, based on an assessment of current recovery and planned harvesting.
- an increase in site productivity estimates, based on the results of OGSI studies.
- active fire suppression outside the THLB to maintain forests that contribute to meeting non-timber objectives.
- reduced green-up ages through the use of OGSI adjustments or genetic gains.
- a relaxation in visual quality objective limits by five percent.
- redefinition of analysis units by bumping up many stands to more productive units, thereby creating a significant increase in standing volume estimates.
- increased harvesting in areas defined as inoperable.
- lower reductions for RTLs based on rehabilitation requirements and narrower actual road widths.
- releasing some constraints generated by the riparian modeling approach.
- the approach to harvest sequence with stand entry occurring closer to culmination.
- underestimation of genetic gains.
- salvage opportunities within Wildlife Tree Patches.

The Forestry Association also expresses the opinion that a greater reliance on timber volumes from domestic watersheds and visually sensitive areas should not be viewed as a downward pressure on timber supply, saying licensees fully

anticipate that historical levels of access to the THLB will be maintained. The association says licensees expect the upcoming spatial modeling project will confirm this assumption.

Eight submissions express support for a reduction in harvest level to:

- the long-term harvest level (one)
- the average harvest level from the past five years (one)
- 550,000 cubic metres (three)
- 605,000 cubic metres (one)
- a level that excludes volumes in steep isolated valleys and forested areas between the highway and the lake along Hwy 31 and Hwy 3A on the east shore (one)
- a level representing a significant reduction, or a deferral of the decision until better socio-economic analysis is available (one)

Submissions supporting a harvest level reduction offer a variety of reasons, including:

- the harvest record since the last Timber Supply Review indicates ongoing public pressure plus licensee aversion to harvesting in sensitive areas.
- no or minor job losses would result given the shortfall in annual harvesting in recent years. It's prudent to not encourage an increase in harvesting in case the long-term harvest level proves to be 500-550,000 cubic metres as indicated by many of the sensitivity analyses.
- numerous downward pressures, including: meeting old seral requirements and creation of OGMAs; increased green-up ages, riparian requirements, RTL deductions, regeneration delays and unsalvaged losses; improved visual quality objectives; caribou and other wildlife management; reduced ECAs in some watersheds and removal of others from the THLB; and, improper inclusion of timber agreement lands in the analysis.
- maintaining the current AAC constitutes significant risk to environmental values.
- reducing pressure on other forest values supports expansion of the tourism industry.
- to maintain options for landscape unit planning and implementation of other environmental protection measures.
- the base case does not fully incorporate "constraints...that reasonably can be expected by use of the area for purposes other than timber production" such as increased environmental constraints (e.g., caribou have recently been red-listed).
- all the scenarios are socially, economically and environmentally detrimental.

First Nations

An individual submission notes that aboriginal rights are protected and have been recognized under the Canadian constitution and in recent court decisions. By setting the AAC high, says this individual, the chief forester would impose unacceptable costs on First Nations and expose the Crown to potential liability for compensation for infringement of aboriginal rights.

Appendix 1

Submissions received by the Kootenay Lake Forest District

Submissions received on the Data Package

Forest industry

Interior Lumber Manufacturers' Association (two submissions)
Kootenay Lake Forestry Association, Licensees (two submissions)

Interest groups

Queens Bay Residents Association

General public

2 individual submissions

Submissions received on the Timber Supply Analysis Report

Forest industry

Tembec Industries Ltd.–BC Division (two submissions)
Kootenay Lake Forestry Association
Celcrest Timber/Wynndel Box & Lumber

Interest groups

Kootenay Centre for Forestry Alternatives
Valhalla Wilderness Society
Queens Bay Residents Association
Erickson Water Users Society

General public

4 individual submissions